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(19)

(54) COMBINATION OF BOTTLE OR FLASK AND CLOSURE THEREFOR

(71) We, DOLL G.m.b.H., a body corporate organized and existing under the laws of the German Federal Republic, of Koblenzer Strasse 112, 53 Bonn-Bad Godesberg, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to the combination of a bottle or flask having an externally-threaded neck and adapted to contain one component of a product, with means for the sealing or hermetic closure of said bottle or flask and for holding captive at least one other component of the product. Generally speaking, one of the components is volumetrically prevalent and consists of a solvent or dispersing liquid and at least one other component consists of a solid substance in granular or pulverulent condition, or a liquid, and is contained in a separate container or receptacle, which is generally also housed in the neck of the bottle or flask.

According to well known and widely adopted technical solutions, the separate container or receptacle is so constructed and arranged as to ensure the opening thereof by knocking out or cutting off its bottom in the direction towards the underlying inside of the bottle or flask so as to put the two components together and to effect their mixing, dispersion, solution or even combination, while retaining the closed condition of the bottle or flask. For dispensing the contents of the bottle or flask, the smaller container or receptacle is removed, so that the bottle or flask may be fully opened. This packaging method is widely used, for example, in the packaging of drugs and other products in general, such as lyophilized and vitaminic products, etc., the separate storage of the part (generally the active fraction of the product) from the liquid or excipient fraction needed for use having the purpose of ensuring a long storage of the packaged goods, thereby avoiding for example phenomena of coagulation, precipitation and others.

Such methods and means do not require further comments as they are already well known.

They are prevalently used in connection with packages of the so-called "monodose" type, namely for drugs or products to be administered or otherwise used in the complete packaged dose, this condition having to be compulsorily fulfilled, on the other hand, because of the existing lack of means adapted to ensure a strictly hermetic sealing of the bottle or flask (or "main container") after the formation of the mixture, solution or dispersion and elimination of the receptacle or smaller auxiliary container.

With the foregoing in mind, it is an object of the present invention to provide the combination with a bottle or flask having an externally-threaded neck and adapted to contain one component of a product, of means for the sealing or hermetic closure of said bottle or flask and for holding captive at least one other component of the product, which combination avoids the above-outlined and further service limitations of the well known means. It is particularly an object of this invention to provide a combination as aforesaid capable of performing in a sequence the three steps of the separate storage of the components, the putting together of these components while retaining the hermetic sealing of the flask or bottle, and finally the repeated hermetic sealing of the bottle or flask, after removal therefrom of the auxiliary container, in intervals between removals from the flask or bottle of the dosages of the

product resulting from the combination of said components.

According to the present invention, we provide in combination with a bottle or flask having an externally-threaded neck and adapted to contain one component of a product, means for the sealing or hermetic closure of said bottle or flask and for holding captive at least one other component of the product, said means comprising an auxiliary container made up of first and second members whereof the first member is substantially cup-shaped and is dimensioned to fit within the neck of the bottle or flask and form a hermetic seal with the inside surface of said neck and the second member is shaped substantially like an upturned cartridge case and is adapted sealingly to fit within the first member with a part of the second member projecting above the first member and the lower end of the second member above the bottom interior of the first member and designed to rupture said bottom when forced thereagainst, and a screw cap for screwing on to said neck of said bottle and provided internally with means co-operable with said first member to limit the extent to which said screw cap can be screwed on to said neck of said bottle while said auxiliary container is in position, removal of said screw cap enabling pressure to be applied in the direction of the bottle interior on said projecting part of said second member to rupture the bottom interior of said first member and bring about mingling of components within said auxiliary container and said bottle, and subsequent removal of said auxiliary container enabling the screw cap to be screwed tightly on to said neck of said bottle for subsequent and repeated hermetic sealing of said bottle.

The screw cap may be provided with a collar of axial length greater than the difference between the axial extents to which the screw cap can be screwed on to the neck on the one hand with the auxiliary container in place, and on the other hand in the absence of the auxiliary container, said collar being provided at its inner periphery with elastically deformable projections and co-operating with saw-toothing on an annular projection integral with said neck and straps connecting between the screw cap and the collar and adapted to be ruptured on unscrewing movement of the screw cap. The elastically deformable projections are preferably arranged to extend obliquely in the direction of the steep sides of the saw teeth.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 shows in enlarged dimensions for reason of simplification and identification of details the combination according to the present invention of a bottle or flask and means for sealing said bottle or flask, in a sectional diametral plane with internal parts in position for packaging and extended storage of a product the components of which are dissociated;

Fig. 2 represents partially in a side and sectional view the individual members of the combination, dissociated from each other and in a position of mutual axial presentation;

Fig. 3 shows likewise a modified embodiment of the member forming the substantially cup-shaped part of the auxiliary container;

Fig. 4 illustrates the screw cap, which is removed from the bottle or flask in order to enable the carrying out of the action leading to the rupturing of the bottom of the auxiliary container, the latter and the neck of the bottle or flask also being shown;

Fig. 5 represents the use of the screw cap for the hermetic re-sealing of the bottle or flask after the full opening thereof for the pouring of the contents thereof, a procedure which may be repeated time and again;

Fig. 6 is a sectional view wherein the open neck is shown in condition of opposition to the screw cap in order to demonstrate the members making said hermetic re-sealing possible;

Fig. 7 shows the screw cap and the neck of the bottle, with a tamper-proof arrangement;

Fig. 8 is a part-section, part-elevation, part-section, of the bottle neck with a security or guaranty collar and unscrewed screw cap;

Fig. 9 shows the bottle neck with screw cap, the auxiliary container being removed; and

Fig. 10 shows a section along the line X-X of Figs. 8 and 9.

Referring now to the drawings, a bottle or flask 10 has a neck 12 which internally over at least part of its length is of cylindrical shape of given diameter D (Fig. 6) and which is provided externally with a male thread 14, said neck terminating at its free end in a lip 16 providing an annular abutment surface.

The bottle or flask 10 is provided with a sealing device which includes, in combination, a pair of members 18 and 20, together forming an auxiliary container for the storage of one component of a product, which one component is to be kept physically separate and hermetically sealed from another component of the product, which other component generally consists of a

solvent or dispersing liquid and is in turn stored in the main container provided by the bottle or flask 10.

The first member 18 (Fig. 3) includes a relatively small-sized container-body 22 which is generally cup-shaped and has a bottom 24, adapted to be knocked out or torn off about its perimeter, being suitably weakened at 26 where it connects with the side wall of the container-body 22. The container-body 22 is provided at its upper end with an external peripheral flange 28 the lower annular face of which may be provided with ribs 30 (Fig. 2) for gripping the lip or rim 16 of the neck or may be planar as shown at 30' in Fig. 3.

The flange 28 surrounds an internal peripheral step 32 at the upper end of the body 22 and which in turn is immediately above an inner annular protrusion 34 which is a tight sliding fit about the member 20. Furthermore, an upper part 22*a* of the small-sized generally cup-shaped body 22 is so dimensioned as to accurately fit within the neck 12 of the bottle or flask 10, that is to say, provide a sufficiently tight grip in order to ensure a hermetic seal with the inside 36 (Fig. 2, 5 and 6) of the bottle neck, the part of the container-body 22 therebelow having therefore a smaller diameter and being connected to the upper part 22*a* through a frusto-conical or suitably-curved section in order to facilitate the fitting and deep insertion of the member 18 into the neck (Figs. 1 and 4), particularly by absorbing any small coaxial errors upon its presentation and thereby easing above all the application of mechanized systems for such insertion and general packaging operations.

The effective sealing engagement between the cup-shaped member 18 and the inside 36 of the neck, so that said member might also individually ensure the sealing of the main container, may be in turn provided by other means.

For example, according to the modification shown in Fig. 3, the upper portion 22*a* of the container-body 22, which may be possibly of a smaller diameter than the inside diameter D of the neck, is provided with at least one external annular rib 38 to ensure the aforesaid effective sealing.

The second member 20 forms the means for breaking the bottom 24 of the member 18, besides forming with the latter the small-sized auxiliary container. The member 20 (see particularly Fig. 2) is in turn shaped substantially like an upturned cartridge case, includes a hollow body 40, closed at its upper end at 42, preferably provided with a slightly-projecting peripheral flange 44 and diametrally dimensioned so as to be insertable through the inner annular protrusion 34 of the member 18 while in effective sealing engagement with said protrusion 34. The lower part 40*a* of the body 40 is of a slightly smaller diameter than and is smoothly connected to the upper part 40 in order to ease the fitting of the member 20 into the member 18 for the previously-outlined purposes in relation to the insertion of the latter member 18 into the neck 12.

As may be particularly seen in Figs. 2 and 4, the lip at the open lower end of body 40, 40*a* is oblique and manifests as indicated at 46 a bevelled edge terminating in a ridge 48 so as to effect the tear-off and opening of the bottom 24 when the member 20 is deeply pushed into the member 18 as shown in Fig. 4.

The small-sized auxiliary compound-container is in turn associated with a screw cap 50 to provide a bottle-sealing device. This screw cap includes a closed upper end 52, a perimetric tubular part 54, provided preferably with an outer indentation or knurling or being otherwise so shaped as to ensure a secure grip for rotation by hand, and including internally a female thread 56, adapted to engage with the male thread 14 of the neck 12. The screw cap 50 also includes internally at its upper end 52 an inner downwardly-extending tubular extension piece 58, the free end of which is preferably frusto-conical as shown at 58*a*. The outside diameter of the piece 58 is of the order of the inside diameter D of the neck 12 (Fig. 6), so that said extension piece 58 may be inserted with substantial sealing engagement and then hermetic sealing into the inside 36 of said neck.

The inside diameter *d* of the extension piece 58 is, however, at least slightly greater than the maximum diameter of the member 20, so as to avoid any contact with the end flange 44 of said member. The lower end 60 of the extension piece 58 provides a planar surface, being so dimensioned as to lie axially opposed to the planar annular surface 62 provided by the flange 28 of the member 18 of the small-sized auxiliary container. The height (h) (Fig. 5) of the cavity resulting inside said extension piece 58 is greater than the extent S (Fig. 1) by which the member 20 of the small-sized container projects beyond the planar annular surface 62 at the upper end of the other member 18 when said member 20 is inserted into the member 18 to ensure the hermetic sealing of the small-sized container, such insertion being sufficiently far only to ensure that the rib 48 does not contact the weakened perimetric portion 26 of the bottom 24, so as to maintain the integrity of said bottom with the remainder of the body 22.

From the foregoing and particularly from the above-considered geometrical and

dimensional relationships of the different members of the combination according to the present invention and from perusal of the different figures shown on the accompanying drawings, there become apparent the properties, possibilities and advantages afforded by this invention. Considering the packaging for long storage purposes of a product consisting of separate components, the sealing device is arranged as shown in Fig. 1. The two members 18 and 20 of the small-sized container are tightly inserted one into the other and ensure consequently the isolation of the component enclosed in the thus-formed receptacle, both from the external environment and from the other component which enclosed in the underlying bottle 10. The inside of the bottle is likewise hermetically sealed by the fitting of the member 18 over the internal part 36 of the mouthpiece 12 of the bottle. The second member 20, projecting by the amount S from the member 18, does not thrust against the bottom 24 of the latter.

The fitting and screwing-on of the screw capsule 50 brings the annular surface 60 into contact with the underlying annular surface 62 of the flange 28, the lower annular face of which with or without the ribs 30, is in contact with the lip 16 of the neck 12. The screw cap 50 therefore ensures stability of the closure without, however, acting on the inner member 20 the projecting portion of which freely extends within the tubular extension piece 58, and acts therefore, as a means limiting the screwing and tightening depth of said screw cap. The unauthorised or untimely removal of the screw cap may be prevented or be made evident in a well-known manner by a warranty band or other external means to be torn off or removed prior to voluntarily effecting such removal of the screw cap.

For the preparation of the product, the screw cap is removed and the projecting portion of the member 20 is exposed and accessible in order to act thereon by hand-applied pressure in the direction A, thereby obtaining the effect shown in Fig. 4 of the opening of the bottom 24 and consequent dropping in the direction B of the contents of the auxiliary container into the underlying bottle and the formation of the desired suspension, solution or combination of the product components. During such operations, the bottle remains at all times hermetically sealed due to the tight insertion of the member 18 into the neck and of the member 20 into the member 18. In order that the contents of the bottle prepared as above may be poured from the bottle, said members 18 and 20 are jointly removed and discarded with consequent full opening of the neck (Fig. 6). The screw cap 50, which remains available and complete, is then used to again seal the bottle by full screwing on of the cap; this is not restricted by the presence of the small-sized inner container, as shown in Fig. 1, and therefore the annular extension piece 58 may itself be inserted in turn with substantial sealing engagement into the inside 36 of the neck, the resulting subsequent hermetic sealing condition being represented in Fig. 5.

Figs. 7 to 10 show the screw cap 50 with a tamper-proof arrangement allowing the possibility of seeing whether the screw cap has or has not been removed. Such tamper-proof arrangements are known *per se*. As the screw cap is capable of taking different positions on the neck of the bottle subject to the presence or absence of the auxiliary container, it is necessary to provide for the screw cap 50 a particular design of tamper-proof arrangement.

As is evident from a comparison between Figs. 1 and 5, the screw cap 50 occupies under the aforementioned first and second operating conditions positions which are axially different relative to the neck 12 of the bottle, the distance or difference existing axially between said positions being denoted A in Fig. 7. However, the tamper-proof arrangement, which is to show whether the screw cap has been unscrewed or not, must not form an obstacle in case of such a variation of the position and of the service. By contrast the intactness of the contents of the small-sized inner container in the first position (Fig. 7) of the original sealing must be ensured.

The tamper-proof arrangement consists of a guaranty collar 64 initially integral with the screw cap 50 and a saw-toothed annular projection 66 integral with the neck 12 and provided below the thread 14 of the latter. The collar 64 is fitted with a number of internal projections 68 which are elastically deformable so that rotation of the collar in direction B (Fig. 10), namely in the direction in which the cap 50 is screwed on thread 14 is possible without impairing the intactness of the unitary structure 50, 64, while it is not possible for the collar 64 to be rotated individually in either sense.

The collar 64 is connected to the lower peripheral edge of the screw cap 50 through a crown 70 which can easily be broken. The crown may consist for instance of a series of small radial stems or straps 72, and the resistance of the saw teeth to the projections 68 is insufficient to prevent movement in direction B of the collar about the saw-toothed annular projection or ring 66. A greater force must, however, be exerted on the cap 50 for unscrewing of same, and if the cap is unscrewed for the first time, the connection

at 70 between the cap and the collar 64 is broken. In consequence, the cap is rotatable individually and may be unscrewed and removed, as is obvious from Fig. 8. The collar 64 when separated this way may remain in place (Figs. 8 and 9), or it may be removed or destroyed.

If the screw cap 50 is rescrewed to the utmost (Fig. 1), the subsequent hermetic sealing is not hindered by the presence of the annular projection or ring 66. The original screw cap must be dimensioned such as to ensure that under the conditions of the initial sealing (Fig. 7) there is between the lower margin 74 of the screw cap 50 and the upper edge or surface 76 of the annular projection or ring 66 (Fig. 8) an axial distance more or less equal to A (Fig. 7). This may be realized if the collar 64, the axial dimension of which is greater than A, is of a sufficient greater diameter than the screw capsule 50 that the use of the inner projections 68 of the collar with the saw-teeth of the annular projection or ring 66 is possible.

The screw cap may consist of any convenient plastics material and be injection moulded.

WHAT WE CLAIM IS:—

1. In combination with a bottle or flask having an externally-threaded neck and adapted to contain one component of a product, means for the sealing or hermetic closure of said bottle or flask and for holding captive at least one other component of the product, said means comprising an auxiliary container made up of first and second members whereof the first member is substantially cup-shaped and is dimensioned to fit within the neck of the bottle or flask and form a hermetic seal with the inside surface of said neck and the second member is shaped substantially like an upturned cartridge case and is adapted sealingly to fit within the first member with a part of the second member projecting above the first member and the lower end of the second member above the bottom interior of the first member and designed to rupture said bottom when forced thereagainst, and a screw cap for screwing on to said neck of said bottle and provided internally with means co-operable with said first member to limit the extent to which said screw cap can be screwed on to said neck of said bottle while said auxiliary container is in position, removal of said screw cap enabling pressure to be applied in the direction of the bottle interior on said projecting part of said second member to rupture the bottom interior of said first member and bring about mingling of components within said auxiliary container and said bottle, and subsequent removal of said auxiliary container enabling the screw cap to be screwed tightly on to said neck of said bottle for subsequent and repeated hermetic sealing of said bottle.

2. The combination claimed in claim 1, in which said means provided internally on said screw cap includes an inner tubular extension piece defining a cavity of such depth and diameter as to receive therein without contact the part of the second member projecting above the first member the axial length, shape and outside diameter of said extension piece enabling same to be inserted tightly into said neck as a result of tighter screwing of the cap on said bottle or flask permitted by the removal from within said neck of said auxiliary container.

3. The combination claimed in claim 2, in which the free end of said tubular extension piece is tapered to facilitate its insertion into said neck.

4. The combination claimed in claims 2 or 3, in which said first member of said auxiliary container includes at its open end a projecting peripheral flange providing lower and upper annular surfaces to abut on the rim of said neck and be abutted by the lower edge of said tubular extension piece of the said capsule, respectively.

5. The combination claimed in claim 4, in which said first member of said auxiliary container is a cylindrical body with a lower portion of reduced diameter to facilitate and lead its insertion into said neck.

6. The combination claimed in claim 5, in which said second member of said auxiliary container is also a cylindrical body with a lower portion of reduced diameter to ease and promote its insertion through the open end of said first member for the formation of said auxiliary container.

7. The combination claimed in claim 4, in which said first member of said auxiliary container includes one or more external annular ribs to provide a hermetic sealing with the inside of said neck.

8. The combination claimed in claim 4, in which said flange of said first member includes at its lower annular surface one or more ribs for gripping the rim of said neck.

9. The combination claimed in any one of claims 1 to 8, in which the screw cap is provided with a collar of axial length greater than the difference between the axial extents to which the screw cap can be screwed on to the neck on the one hand with the auxiliary container in place and on the other hand in the absence of said auxiliary container, said collar being provided at its inner periphery with elastically deformable projections and co-

operating with saw-toothing on an annular projection integral with said neck and straps connecting between the screw cap and the collar and adapted to be ruptured on unscrewing movement of the screw cap.

10. The combination claimed in claim 9, in which the elastically deformable projections are arranged to extend obliquely in the direction of the steep sides of the saw teeth.

11. The combination of a bottle or flask having an externally-threaded neck and adapted to contain one component of a product, means for the sealing or hermetic closure of said bottle or flask and for holding captive at least one other component of the product, substantially as hereinbefore described with reference to the accompanying drawings.

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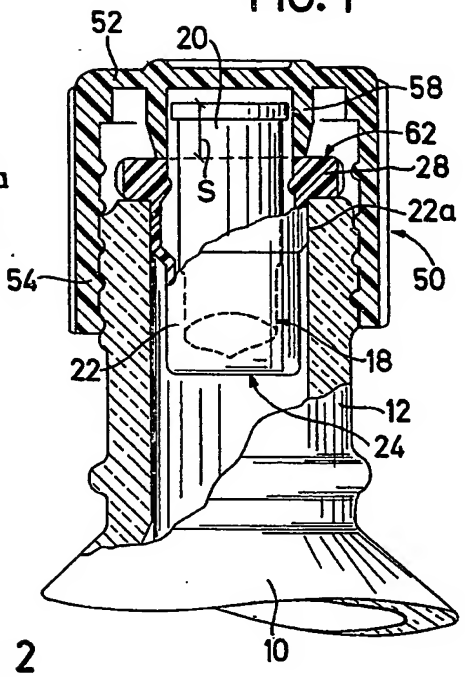
3 SHEETS
COMPLETE SPECIFICATION
This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

FIG. 1



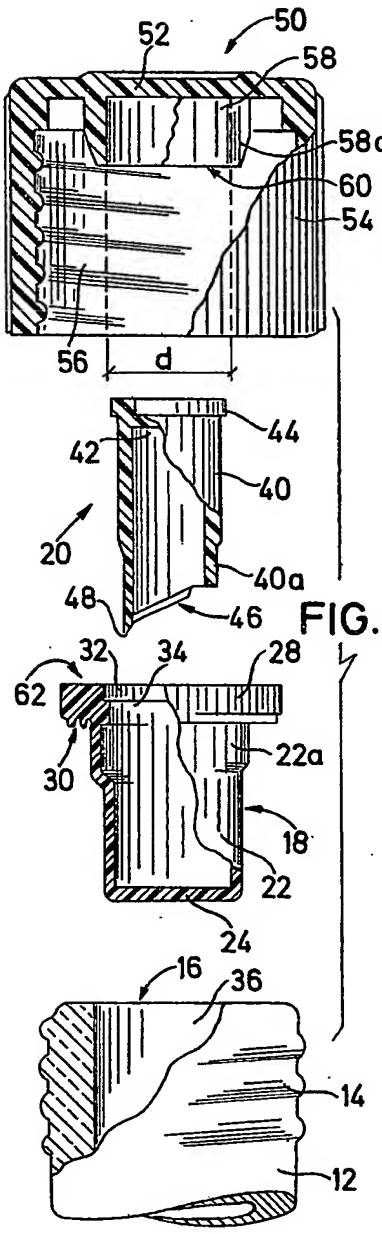


FIG. 2

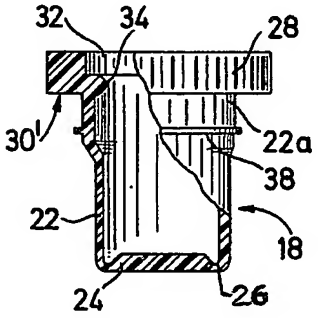


FIG. 3

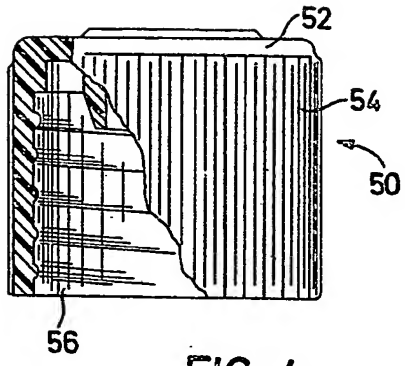


FIG. 4

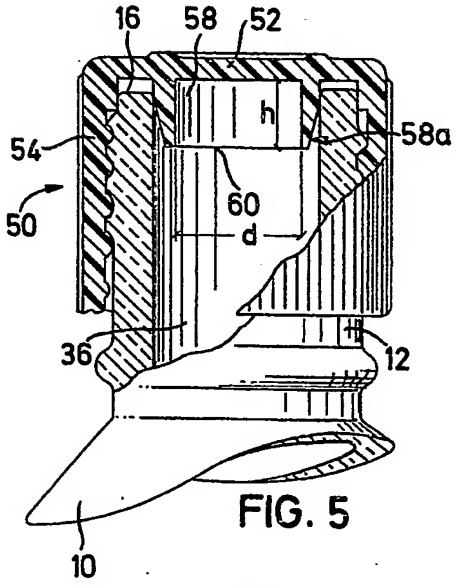


FIG. 5

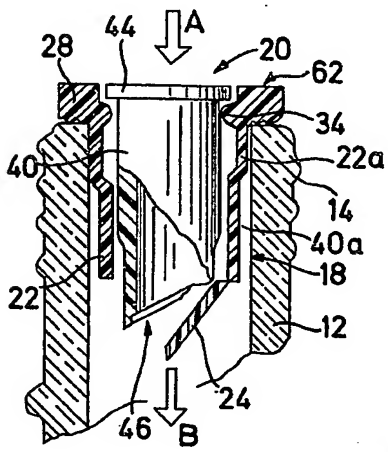


FIG. 6

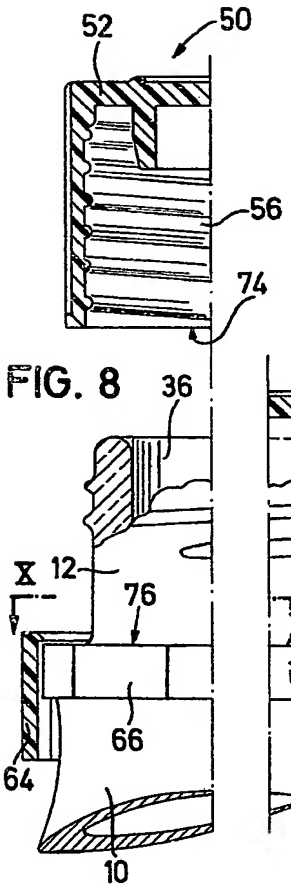


FIG. 8

FIG. 9

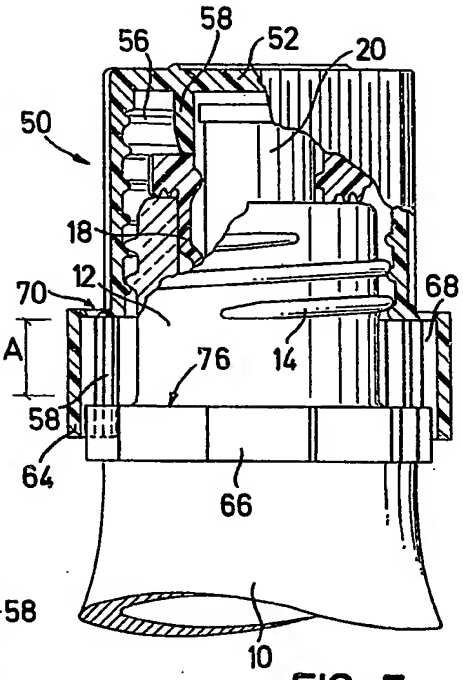


FIG. 7

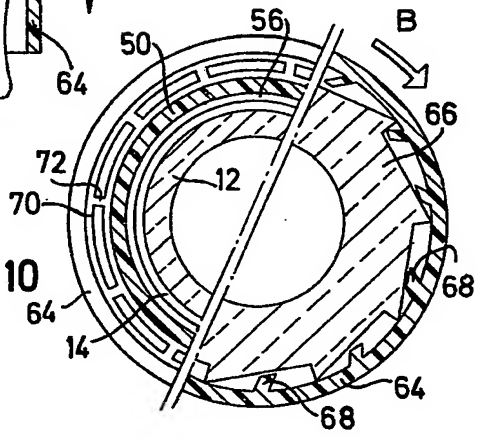


FIG. 10